

8. The optical modulating device of claim 7, wherein the permittivity change layer comprises an active area in which a carrier concentration changes based on the applied voltage.

9. The optical modulating device of claim 1, wherein the permittivity change layer comprises a transparent conductive oxide.

10. An optical apparatus comprising the optical modulating device of claim

11. An optical modulating device comprising:

a substrate;

nanoantennas disposed on the substrate and spaced apart from one another;

a dielectric layer disposed on the nanoantennas;

a permittivity change layer disposed on the dielectric layer and having a variable permittivity; and

a light-emitting structure disposed on the permittivity change layer and between the nanoantennas.

12. The optical modulating device of claim 11, wherein the light-emitting structure is configured to emit light having a greater wavelength than light incident on the light-emitting structure in response to the incident light, as an excitation source.

13. The optical modulating device of claim 11, wherein the light-emitting structure comprises light-emitting particles.

14. The optical modulating device of claim 13, further comprising an insulating material layer disposed on the permittivity change layer, the light-emitting particles being embedded in the insulating material layer.

15. The optical modulating device of claim 11, wherein the light-emitting structure comprises a semiconductor quantum well or a semiconductor PN junction.

16. The optical modulating device of claim 11, further comprising an insulating material layer covering the permittivity change layer and the light-emitting structure.

17. The optical modulating device of claim 11, further comprising voltage-apppliers configured to apply respective voltages between the respective nanoantennas and the permittivity change layer.

18. The optical modulating device of claim 11, wherein the permittivity change layer comprises a transparent conductive oxide.

19. An optical apparatus comprising:

the optical modulating device of claim 11; and

a backlight configured to provide light to the optical modulating device.

20. The optical apparatus of claim 19, further comprising a driving circuit disposed on the substrate and configured to control voltages applied to the respective nanoantennas.

* * * * *